3.4 Solving Quadratic Equations

In the last problem, you explored ways to write a quadratic expression in factored form. In this problem, you will use the factored form to find solutions to a quadratic equation.

If you know that the product of two numbers is zero, what can you say about the numbers?

Getting Ready for Problem 3.4

- How can you solve the equation $0 = x^2 + 8x + 12$ by factoring?

First write $x^2 + 8x + 12$ in factored form to get $(x + 2)(x + 6)$. This expression is the product of two linear factors.

- When $0 = (x + 2)(x + 6)$, what must be true about one of the linear factors?
- How can this information help you find the solutions to $0 = (x + 2)(x + 6)$?
- How can this information help you find the x-intercepts of $y = x^2 + 8x + 12$?

Problem 3.4 Solving Quadratic Equations

A. **1.** Write $x^2 + 10x + 24$ in factored form.

2. How can you use the factored form to solve $x^2 + 10x + 24 = 0$ for x?

3. Explain how the solutions to $0 = x^2 + 10x + 24$ relate to the graph of $y = x^2 + 10x + 24$.

B. Solve each equation for x without making a table or graph.

1. $0 = (x + 1)(2x + 7)$

2. $0 = (5 - x)(x - 2)$

3. $0 = x^2 + 6x + 9$

4. $0 = x^2 - 16$

5. $0 = x^2 + 10x + 16$

6. $0 = 2x^2 + 7x + 6$

7. How can you check your solutions without using a table or graph?

C. Solve each equation for x without making a table or graph. Check your answers.

1. $0 = x(9 - x)$

2. $0 = -3x(2x + 5)$

3. $0 = 2x^2 + 32x$

4. $0 = 18x - 9x^2$

D. You can approximate the height h of a pole-vaulter from the ground after t seconds with the equation $h = 32t - 16t^2$.

1. Suppose the pole-vaulter writes the equation $0 = 32t - 16t^2$. What information is the pole-vaulter looking for?

2. The pole-vaulter wants to clear a height of 17.5 feet. Will the pole-vaulter clear the desired height? Explain.

ACE **Homework starts on page 45.**

Did You Know?

You can find the solutions to many quadratic equations using tables or graphs. Sometimes, however, these methods will give only approximate answers. For example, the solutions to the equation $x^2 - 2 = 0$ are $x = \sqrt{2}$ and $x = -\sqrt{2}$. Using a table or graph, you only get an approximation for $\sqrt{2}$.

You can try a factoring method, but the probability of readily factoring any quadratic expression $ax^2 + bx + c$, where a, b, and c are real numbers is small.

We know that the Greeks used a geometric method to solve quadratic equations around 300 B.C. Mathematicians from India probably had methods for solving these equations around 500 B.C., but their methods remain unknown.

For years, mathematicians tried to find a general solution to $ax^2 + bx + c = 0$. In a book published in 1591, François Viète was the first person to develop a formula for finding the roots of a quadratic equation. It is called the *quadratic formula* and is given below.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

This formula can be used for any quadratic equation. You will learn more about this formula in later mathematics courses.

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For: Information about François Viète
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